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NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION
Department of Horticulture

Fruit Bud Formation

Progress of Investigations in 1908, 1909, 1910

A Baldwin Apple Tree, the Halves of Which Bear in Alternate Years

By B. S. PICKETT

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM, NEW HAMPSHIRE

NEW HAMPSHIRE COLLEGE OF AGRICULTURE
AND THE MECHANIC ARTS

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION

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FRUIT BUD FORMATION.

By B. S. Pickett.

The subject of fruit bud formation is so comprehensive that any investigation into the causes which bring about the formation of fruit buds, or into means by which these causes may be controlled or directed, leads one into a field so vast that it becomes immediately apparent that the subject must be studied phase by phase. Among the factors that underlie the formation of fruit buds are climatic conditions, varietal forms and adaptations, supply of plant food, supply of moisture, age or maturity of the plant, and its health or vitality as affected by natural agencies such as attacks by insect pests, or fungous diseases, or by artificial practices such as pruning, training, thinning, and spraying. Investigations on fruit bud formation by the Department of Horticulture at the New Hampshire Agricultural Experiment Station have, therefore, been limited to such experiments as the material, means, and time of the department required. They are, however, designed to give results of permanent value from a scientific standpoint as well as to furnish data of practical value to the fruit growers of the state.

In accordance with the plan of limiting the field of investigation to the means at the disposal of the department, it was decided to experiment only with the most important fruit grown in the state, the apple, and further to confine the work to the variety most largely grown, the Baldwin. The factors chosen as first in line for investigation include a comparative study of certain methods of cultivation, fertilization and cover cropping. It was further planned to experiment on the effects of both top and root pruning. The material, however, proved unsuitable for this purpose, the plan for top-pruning being abandoned at the outset of the experiment and the attempt at special root-pruning being abandoned at the close of the season of 1910.

Method of Procedure.

An orchard which, at the beginning of the experiment, consisted of 302 trees, was leased for a period of ten years. This orchard is located on the farm of Mrs. S. J. Woodman, and is two and one-half miles from the college. With the exception of a few trees at the south end of the orchard all are Baldwins, and were about 25 years old at the beginning of the experiment. The soil is sandy in character, remarkably uniform in physical characteristics from end to end of the orchard, and almost perfectly level. It has an eastern exposure and is protected on the west by a ridge in the adjoining field. The orchard is divided into ten plots, separated by division rows. Another plot, numbered eleven, crosses plots 7, 8, 9 and 10. Chart No. 1 illustrates the plan of the plots and the arrangement of trees in the orchard. Of the original 302 trees a considerable number which, from one cause or another, were considered unsuitable for the experiment, have been eliminated and do not appear in the chart.

The schedule of treatments of the various plots during 1908, 1909, and 1910 is as follows:

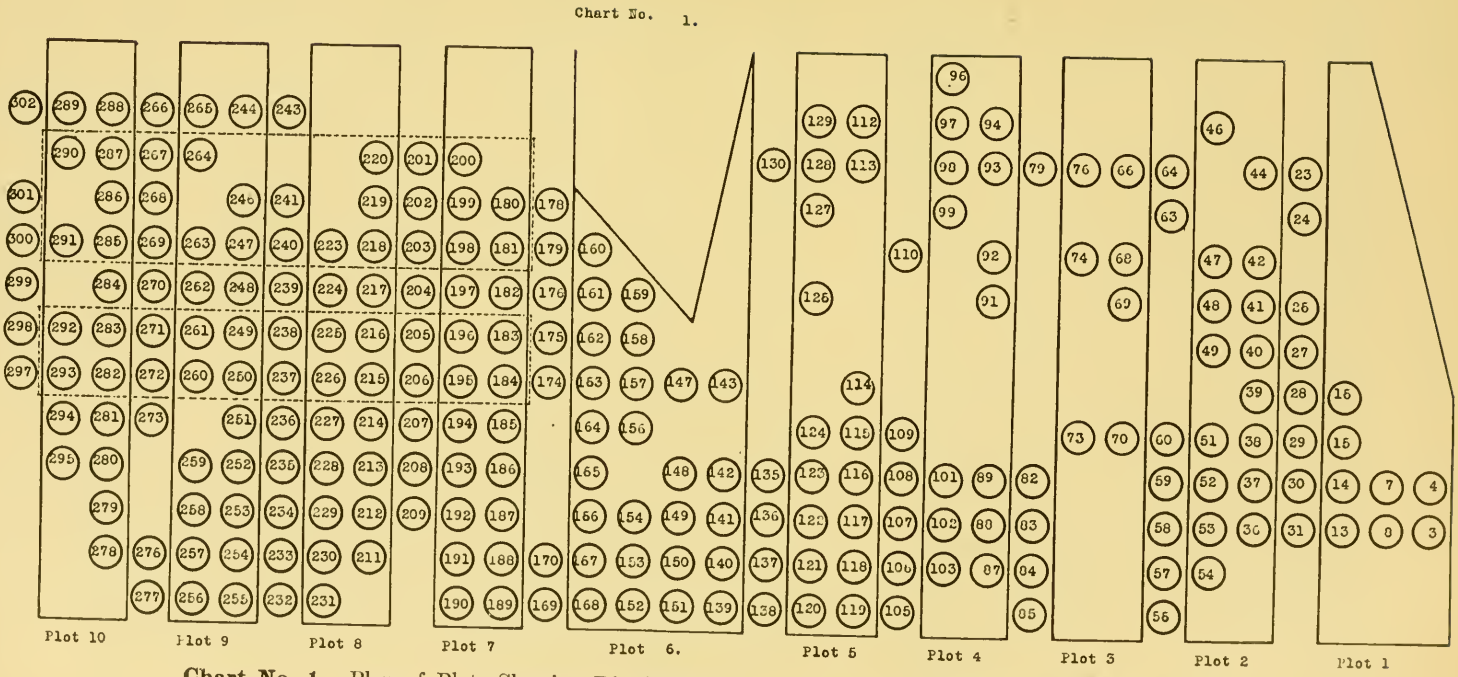


Chart No. 1. Plan of Plots Showing Distribution and Arrangement of Trees in Experimental Orchard.

Plot 1. Sod.

To remain permanently in sod. Grass to be mown when inconveniently long and allowed to remain. No fertilizer to be applied.

Plot 2. Cultivated the odd year, seeded the even year.

To be plowed every second year commencing in 1909, cultivated every two weeks till July 10; then sown with a cover crop of crimson clover. To be plowed in spring and seeded immediately with a grass and clover mixture consisting of 10 lbs. timothy, 10 lbs. red clover and 5 lbs. of White Dutch clover every second year commencing in 1908. The resulting crop is to be mown if inconveniently long, and allowed to remain on the ground. No fertilizer to be applied.

Plot 3. Cultivated the even year; seeded the odd year.

To be plowed in 1908, and cultivated every two weeks till July 10; then sown with a cover crop of crimson clover. To be plowed in spring and seeded immediately with a grass and clover mixture consisting of 10 lbs. timothy, 10 lbs. of red clover, and 5 lbs. of white Dutch clover, every second year commencing in 1909. The resulting crop is to be mown if inconveniently long and allowed to remain on the ground. No fertilizer to be applied.

Plot 4. Clean Culture.

To be plowed in spring annually and cultivated every two weeks till September 1st. No cover crop. No fertilizer to be applied.

Plot 5. Cultivation and Cover Crop.

To be plowed in spring annually and cultivated every two weeks till July 10; then seeded with a cover crop of crimson clover. No fertilizer to be applied.

Plot 6. Root Pruning.

To be plowed very deeply, 7 to 8 inches, as a means of root pruning, plowing to be done annually in spring, and followed by cultivation every two weeks till July 10; then seeded with a cover crop of crimson clover. Fertilized with 0.3 lbs. nitrogen, 0.5 lbs. phosphorus, and 0.75 lbs. potassium, per tree.

Plot 7. Normal Fertilizer.

To be plowed in spring, annually, cultivated every two weeks till July 10; then sown with a cover crop of crimson clover. Fertilized with 0.3 lbs. nitrogen, 0.5 lbs. phosphorus, and 0.75 lbs. potassium, per tree.

Plot 8. Excess Phosphorus.

To be plowed in spring, annually, cultivated every two weeks till July 10; then sown with a cover crop of crimson clover. Fertilized with 0.3 lbs. nitrogen, 0.1 lbs. phosphorus, and 0.75 lbs. of potassium, per tree.

Plot 9. Excess Nitrogen.

To be plowed in spring, annually, cultivated every two weeks till July 10; then sown with a cover crop of crimson clover. Fertilized with 0.6 lbs. nitrogen, 0.5 lbs. phosphorus, and 0.75 lbs. potassium per tree.

Plot 10. Excess Potassium.

To be plowed in spring, annually, cultivated every two weeks till July 10; then seeded with a cover crop of crimson clover. Fertilized with 0.3 lbs. nitrogen, 0.5 lbs. phosphorus, and 1.5 lbs. potassium, per tree.

Plot 11. Limed.

To receive in addition to the treatments given plots 7, 8, 9 and 10, which it crosses, 20 lbs. agricultural lime (slaked lime) per tree.

Notes:

Plowing, except in the case of plot 6, 4 1-2 to 5 inches in depth.

All plots receive pruning and spraying in accordance with the best orchard practice, and all receive the same treatment in these respects.

For cover crops use 20 lbs. of seed per plot, except in plot 6, where 30 lbs. are needed.

Nitrogen is to be supplied in the following form: 1-3 nitrate of soda, 2-3 dried blood; phosphorus, as acid phosphate, and potassium, as high grade sulphate of potash.

REPORT OF PROGRESS IN 1908.

The first operation performed in the orchard under experimentation consisted in a severe pruning of all the trees. This was necessitated partly on account of the fact that the orchard had been neglected in this particular for many years previous, but more especially because of winter injury resulting from a winter of unprecedented severity in 1906–1907. Following the pruning, the various plots were fertilized in accordance with the plan, except plot 11, which, for some reason unknown to the writer, was omitted.

The author assumed charge of this project in July, 1908, and though the season was then late, the work of cultivation in accordance with the plan of the experiment, was undertaken immediately. All plots from number 3 to number 10 were placed in a condition of first-class tillage and, with the exception of plot 4 which was cultivated every two weeks till September 1st, were sown with cover crops of crimson clover. An excellent stand of clover resulted from this seeding, a growth of six inches being secured before winter.

Besides the work of cultivation, a further pruning was given to remove dead wood and cankered branches which had appeared since the first pruning or which had been overlooked at that time. All trees were also scraped and washed with a preparation of whale oil soap and carbolic acid.

The records made during the year consisted in a diary of all operations and in an accurate record of the number of apples of all grades for each tree in the orchard. This record appears in table No. 1.

TABLE NO. 1.

Average Number of Apples per Tree in all Plots in 1908.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	Number of Apples.			
				No. 1.	No. 2.	Culls.	Total.
1	In sod. No cultivation.	None.	None.	139	222	106	467
2	Cult. every other year commencing 1909.	None.	None.	85	59	22	166
3	Cult. every other year commencing 1908.	None.	Crimson clover sown July 10, 1908.	65	35	18	118
4	Plowed early in May. Cult. every 2 weeks till Sept. 1st., annually.	None.	None.	50	38	17	105
5	Plowed early in May. Cult. every 2 weeks till July 10, annually.	None.	Crimson clover sown July 10, annually.	27	32	19	78
6	Plowed very deeply in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. P. K.	Crimson clover sown July 10, annually.	26	30	13	69
7	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. P. K.	Crimson clover sown July 10, annually.	29	25	14	68
8	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. &. K. Excess Phosphorus.	Crimson clover sown July 10, annually.	14	21	25	60
9	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts K. &. P. Excess Nitrogen.	Crimson clover sown July 10, annually.	71	21	14	107
10	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. &. P. Excess Potassium.	Crimson clover sown July 10, annually.	88	24	13	125
11	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Limed. Crosses and includes sections of 7, 8, 9, 10.	Crimson clover sown July 10, annually.				

No conclusions may be drawn from the work of 1908 so far as fruit bud formation is concerned. Morphological studies have shown that fruit buds are formed during the previous season. No treatments, therefore, given in 1908 would affect the formation of fruit buds during that season. The record of fruit production is, however, important for purposes of comparison with the results of later seasons.

REPORT OF PROGRESS IN 1909.

The plan originally arranged for these experiments was rigidly adhered to throughout the season and all the work was carefully and thoroughly performed. The trees were well and properly pruned before growth started in the spring. The various plots were cultivated, fertilized, and planted with cover crops according to the plan and at the times called for by the schedule. By this time, the orchard was recovering from the effects of winter injury and from the lack of care which prevailed up to the time when it was taken over by the Department of Horticulture.

The spraying treatment in 1909 was as follows: First spraying, applied before the blossom buds opened and just as first leaf buds began to expand: 6–4–50 Bordeaux mixture with 3 lbs. arsenate of lead and 4 ozs. of Paris green added. Second spraying, applied immediately after the blossoms fell: 3 lbs. of arsenate of lead, 4 ozs. of Paris green, 1-2 lb. of lime and 50 gals. of water. Third spraying, applied 10 days after second spraying; same formula as for second spraying. Fourth spraying, applied first week in August to control brown tail moth and second brood of codling moth; same formula as for second spraying. Fifth spraying, applied September 16th, to overcome a severe attack of apple leaf-hoppers: kerosene emulsion, 9 parts water to 1 part kerosene emulsion.

The spraying treatment was thoroughly successful in controlling the codling moth, all leaf-eating insects, and apple scab; but did not wholly prevent a very slight attack of sooty blotch, which appeared late in the season. The kerosene emulsion appeared to destroy great numbers of the leaf-hoppers but either the total number of these insects was so great, or the supply was so augmented from an orchard in the adjoining field, that the spraying could not be called a success in controlling this insect.

The following records were obtained:

First, 20 characteristic twigs of each tree were measured, the growth during the seasons of 1907 and 1908 being determined.

Second, all the wood pruned from the trees was tied up in bundles and weighed.

Third, as in 1908, the apples produced by each tree were graded according to their quality, and the number of each kind was recorded. The total number of apples produced was 11,057. The average number of apples produced by each plot, per tree, appears in table No. 2.

TABLE NO. 2.

Average Number of Apples per Tree, in all Plots in 1909.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	Number of Apples.			
				No. 1.	No. 2.	Culls.	Total.
1	In sod. No cultivation.	None.	None.	35	44	16	95
2	Plowed early in May, 1909. Cult. every 2 weeks till July 10. In grass 1908 & 10.	None.	Crimson clover sown July 10, 1909.	53	11	5	68
3	Plowed early in May, 1908 & 10. Cult. every 2 weeks till July 10. In grass, 1909.	None.	Crimson clover sown July 10, 1908 & 10.	67	20	14	101
4	Plowed early in May. Cult. every 2 weeks till Sept. 1, annually.	None.	None.	80	11	16	106
5	Plowed early in May. Cult. every 2 weeks till July 10, annually.	None.	Crimson clover sown July 10, annually.	64	11	15	79
6	Plowed very deeply in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. P. K.	Crimson clover sown July 10, annually.	44	6	6	56
7	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. P. K.	Crimson clover sown July 10, annually.	53	12	5	70
8	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts N. & K. Excess Phosphorus.	Crimson clover sown July 10, annually.	61	11	6	78
9	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amounts K. & P. Excess Nitrogen.	Crimson clover sown July 10, annually.	72	9	8	89
10	Plowed early in May. Cult every 2 weeks till July 10, annually.	Normal amounts N. & P. Excess Potassium.	Crimson clover sown July 10, annually.	26	1	1	28

No attempt should be made to draw any conclusions from the results of the work in 1909 owing, first, to the light crop which prevailed through all plots, and second, to the fact that the treatments of the various plots had not been long enough in progress to produce noticeable effects on the formation of fruit buds.

REPORT OF PROGRESS IN 1910.

As in 1909, the first operation performed consisted in pruning all the trees in the orchard. This was following by a spraying with lime-suphur wash applied before the buds started into growth in the spring. The formula used was composed of 15 lbs. of lime and 15 lbs. sulphur to 50 gals. of water. The mixture was cooked by steam derived from the college heating plant. Later operations consisted in spraying with arsenate of lead paste, 3 lbs. to 50 gals. of water, immediately after the blossoms fell. A similar application was made two weeks later, and a third application was given the first week in August. The orchard was sprayed again during the second week in August with kerosene emulsion for apple leaf-hoppers. As in 1909, the spraying seemed to destroy large numbers of the insect, but was not effective in eradicating it. With the exception of this insect all other pests were thoroughly controlled, and so completely was the codling moth eradicated that not a single wormy apple was discovered in the orchard.

All operations in connection with the applications of fertilizers and the cultivation of the plots were carried out according to schedule.

The records made during the year include an estimate of the number of blossoms produced by each tree, an exact record of the number and grades of fruit, a diary of all work performed in the orchard, and a record of twig growth for the season of 1909.

The inclusion of the blossom estimate was an innovation of 1910. Such a record was considered desirable in view of the fact that accidents of storm, insect attack, or disease might later reduce the crop and vitiate a year's results. The record was made with the greatest care. A standard tree, apparently as full of blossoms as a tree could possibly be, was graded 100. Each tree in the orchard was given a percentage grading as compared with the standard tree. Three separate records were made at daily intervals in the height of the blooming season, and the average of the three gradings was recorded.

The records show that there were produced in the orchard on all trees which were included in the plots and division rows 401,660 apples. In addition to these, some 50 trees were discarded and their fruits, though recorded, are not included in this total; 500 barrels were marketed, and in addition to these a large number of apples, blown off in a wind storm just as the picking season began, were sold for cider.

Yield of the Orchard Plot by Plot.

The ensuing tables, Nos. 4 to 14, give the yields of each plot tree by tree. From each plot have been deducted certain individual trees, the productions of which were far out of the range of productions of the other trees in the

same plot. These trees are not, however, included in the list which were permanently discarded because of poor health, low vitality or injury from wind or winter killing. They are normal trees in appearance, and considered individually, may, from time to time, throw light of equal significance on the subject of fruit bud formation, with other trees in the same plot. These trees, whose results are not included in the averages, appear to be in every way similar to their neighbors, and their low production is not traceable to any apparent cause or difference in treatment. The fairness of this elimination of exceptional individuals becomes apparent on a comparison of charts 2 and 3. Chart No. 2 shows in a graphic form the distribution of apples, tree by tree for the entire orchard. Chart No. 3 shows the distribution in the various plots when the exceptional individuals and discarded trees have been omitted.

With the exception of plot No. 3, comment is unnecessary in the presentation of the tables showing the productions of the plots. Plot No. 3 shows one of the largest average yields per tree in the entire orchard. It must be taken into account, however, that this plot contains only 5 trees, all other plots containing from two to four times this number of individuals. A reference to chart No. 1 (the plan of the orchard) will show that these 5 individuals have more soil area per tree and more light and air than the trees in other plots. This is due to the death of the surrounding trees at some time previous to the lease of the orchard by the college. Some allowance must therefore be made when comparing this plot with other plots.

TABLE NO. 3.

Apples in Plot 1, Season of 1910.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
3	121	126	144	391	126	105	201	432	247	231	345	823
4	119	59	20	198	64	82	106	252	183	141	126	450
7	10	22	16	48	5	13	32	50	15	35	48	98
8	172	149	125	446	139	175	138	452	311	324	263	898
13	92	86	41	219	83	81	89	253	175	167	130	472
14	154	145	56	355	80	124	226	430	234	269	282	785
15	32	40	14	86	36	32	71	139	68	72	85	225
16	0	0	0	0	41	36	20	97	41	36	20	97
Totals	700	627	416	1,743	574	648	883	2,105	1,274	1,275	1,299	3,848
Avgs.	88	78	52	218	72	81	110	263	159	159	162	481

TABLE NO. 4.
Apples in Plot 2, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
36	128	217	21	366	87	229	67	383	215	446	88	749
37	274	288	26	588	230	434	80	744	504	722	106	1,332
38	288	366	0	594	85	472	106	663	313	838	106	1,257
39	1,526	414	82	2,022	220	227	58	505	1,746	641	140	2,527
40	551	147	36	734	485	147	20	652	1,036	294	56	1,386
41	270	63	11	344	315	112	15	442	585	175	26	786
42	260	90	50	400	190	150	140	480	450	240	190	880
44	340	125	17	482	76	21	12	109	416	146	29	591
46	310	178	44	532	220	300	63	583	530	478	107	1,115
47	25	35	0	60	265	223	67	555	290	258	67	615
48	360	75	10	445	452	148	60	660	812	223	70	1,105
49	270	160	25	455	160	140	31	331	430	300	56	786
51	180	140	0	320	192	80	15	287	372	220	15	607
52	285	295	0	580	460	876	68	1,404	745	1,171	68	1,984
53	560	1,610	390	2,560	350	565	90	1,005	910	2,175	480	3,565
54	335	170	45	550	70	35	40	145	405	205	85	695
Totals	5,902	4,373	757	11,032	3,857	4,159	932	8,948	9,759	8,532	1,689	19,980
Avgs.	369	273	47	690	241	260	58	559	610	533	106	1,249

TABLE NO. 5.
Apples in Plot 3, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
66	1,633	1,385	190	3,208	360	510	135	1,005	1,993	1,895	325	4,213
*68	146	11	1	158	80	10	10	100	226	21	11	258
69	823	191	42	1,056	690	51	31	772	1,513	242	73	1,828
70	427	194	66	687	324	414	154	829	751	608	220	1,579
73	365	280	22	667	350	360	39	749	715	640	61	1,416
*74	330	55	11	396	250	15	20	285	580	70	31	681
76	1,281	520	58	1,859	277	200	190	667	1,558	720	248	2,526
Totals	5,005	2,636	390	8,031	2,331	1,560	579	4,470	7,336	4,196	969	12,501
Less*	476	66	12	554	330	25	30	385	806	91	42	939
Bal.	4,529	2,570	378	7,477	2,001	1,535	549	4,085	6,530	4,105	927	11,562
Avgs.	906	514	76	1,495	400	307	110	817	1,305	821	185	2,311

TABLE NO. 6.

Apples in Plot 4, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
S7	565	260	51	876	245	255	61	561	810	515	112	1,437
S8	1,580	1,310	135	3,025	200	525	98	823	1,780	1,835	233	3,848
S9	550	545	22	1,117	475	650	96	1,221	1,025	1,195	118	2,338
91	830	330	60	1,220	75	120	35	230	905	450	95	1,450
*92	275	100	2	377	85	65	28	178	360	165	30	555
93	285	182	10	477	325	160	68	553	610	342	78	1,030
94	896	697	96	1,689	155	150	42	347	1,051	847	138	2,036
96	740	320	23	1,083	40	135	30	205	780	455	53	1,288
97	1,195	645	20	1,860	215	340	115	670	1,410	985	135	2,530
98	1,010	355	15	1,380	245	385	190	820	1,255	740	205	2,200
99	540	415	65	1,020	130	260	70	460	670	675	135	1,480
101	695	800	42	1,537	85	170	75	330	780	970	117	1,867
102	300	220	45	565	70	125	45	240	370	345	90	805
*103	355	80	5	440	50	70	25	145	405	150	30	585
Totals	9,816	6,259	591	16,666	2,425	3,417	983	6,825	12,241	9,676	1,574	23,491
Less*	633	180	7	820	165	142	58	365	795	322	65	1,182
Bal.	9,183	6,079	584	15,846	2,260	3,275	925	6,460	11,446	9,354	1,509	22,309
Avgs.	765	507	49	1,321	188	273	77	538	954	779	126	1,859

TABLE NO. 7.

Apples in Plot 5, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
112	600	910	190	1,700	345	285	69	699	945	1,195	259	2,399
113	490	935	230	1,655	340	550	12	902	830	1,485	242	2,557
*114	60	55	10	125	25	25	5	55	85	80	15	180
115	465	455	65	985	110	90	9	209	575	545	74	1,194
116	735	855	110	1,680	370	590	85	1,045	1,105	1,425	195	2,725
*117	185	95	10	290	15	10	2	27	200	105	12	317
118	720	765	90	1,575	190	310	22	522	910	1,075	112	2,097
119	1,045	1,180	150	2,375	405	530	43	978	1,450	1,710	193	3,353
120	1,025	1,000	160	2,185	550	445	33	1,028	1,575	1,445	193	3,213
*121	290	120	20	430	105	50	16	171	395	170	36	601
122	760	850	140	1,750	325	380	42	747	1,085	1,230	182	2,497
123	1,300	1,155	120	2,575	560	385	51	996	1,860	1,540	171	3,571
124	1,400	605	45	2,050	245	110	37	392	1,645	715	82	2,442
126	1,040	430	55	1,525	190	123	21	334	1,230	553	76	1,859
127	355	230	60	645	102	68	19	189	457	298	79	834
128	330	600	125	1,055	140	295	25	460	470	895	150	1,515
129	410	1,050	240	1,700	715	560	108	1,383	1,125	1,610	348	3,083
Totals	11,210	11,270	1,820	24,300	4,732	4,806	599	10,137	15,942	16,076	2,419	34,437
Less*	535	270	40	845	145	85	23	253	680	355	63	1,098
Bal.	10,675	11,000	1,780	23,455	4,587	4,721	576	9,884	15,262	15,721	2,356	33,339
Avgs.	763	786	127	1,675	328	337	41	706	1,090	1,123	168	2.381

TABLE NO. 8.

Apples in Plot 6, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls.	
139	1,555	975	172	2,702	200	430	50	680	1,755	1,405	222	3,382
*140	115	15	0	130	55	25	40	120	170	40	40	250
141	930	1,845	345	3,120	185	625	80	890	1,115	2,470	425	4,010
142	295	175	34	504	830	585	134	1,549	1,125	760	168	2,053
143	415	195	77	687	135	120	119	274	550	315	96	961
147	400	180	77	657	180	105	31	316	580	285	108	973
*148	190	85	3	278	85	25	24	134	275	110	27	412
149	410	505	103	1,018	100	325	48	473	510	830	151	1,491
150	375	270	17	662	75	45	35	155	450	315	52	817
151	385	510	75	970	660	1,025	114	1,799	1,045	1,535	189	2,769
152	670	720	55	1,445	290	350	54	694	960	1,070	109	2,139
*153	190	105	20	315	80	90	15	185	270	195	35	500
154	776	63	15	854	155	133	26	314	931	196	41	1,168
156	1,405	162	18	1,585	170	230	50	450	1,575	392	68	2,035
157	1,495	340	21	1,856	370	348	111	829	1,865	688	132	2,685
158	1,080	465	19	1,564	205	305	58	568	1,285	770	77	2,132
159	1,212	501	83	1,796	155	180	43	378	1,367	681	126	2,174
160	1,440	95	15	550	80	25	21	126	520	120	36	676
161	810	332	1	1,143	180	125	38	343	990	457	39	1,486
162	1,295	515	21	1,831	445	260	108	813	1,740	775	129	2,644
163	502	51	2	555	200	100	90	390	702	151	92	945
164	1,600	108	13	1,721	390	80	42	512	1,990	188	55	2,233
165	1,252	140	17	1,409	245	195	53	493	1,497	335	70	1,902
*166	195	10	10	215	60	5	30	95	255	15	40	310
167	385	215	15	'615	125	60	31	216	510	275	46	831
168	390	330	30	750	190	35	36	261	580	365	66	1,011
Total	18,767	8,907	1,225	28,932	5,854	5,831	1,381	13,057	24,612	14,738	2,639	41,989
Less*	690	215	33	938	280	145	109	534	970	360	72	1,472
Bal.	18,077	8,692	1,225	27,994	5,565	5,686	1,272	12,523	23,642	14,378	2,497	40,517
Avgs.	822	395	56	1,272	253	258	58	569	1,075	654	114	1,842

TABLE NO. 9.

Apples in Plot 7, Season of 1910.

Tree No.	Picked Apples.				Fallen Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
180	1,205	568	26	1,799	340	200	30	570	1,545	768	56	2,369
181	1,075	235	41	1,361	265	100	57	422	1,340	335	98	1,773
182	1,570	640	39	2,249	185	325	94	604	1,755	965	133	2,853
183	890	435	36	1,361	185	325	390	900	1,075	760	426	2,261
184	1,175	375	55	1,605	155	155	80	390	1,330	530	135	1,995
185	725	280	55	1,060	295	220	25	540	1,020	500	80	1,600
186	815	535	105	1,455	75	190	30	295	890	725	135	1,750
187	1,055	525	75	1,655	215	295	45	555	1,270	820	120	2,210
188	680	310	60	1,050	195	245	25	465	875	555	85	1,515
189	780	430	35	1,245	175	265	30	470	955	695	65	1,715
190	650	125	40	815	470	90	30	590	1,120	215	70	1,405
*191	335	25	15	375	145	30	34	209	480	55	49	584
192	905	115	15	1,035	405	95	22	522	1,310	210	37	1,557
193	1,180	825	30	2,035	570	545	34	1,149	1,750	1,370	64	3,184
194	825	110	35	970	195	35	10	240	1,020	145	45	1,210
195	1,075	637	128	1,840	445	300	60	805	1,520	937	188	2,645
196	925	375	147	1,447	485	265	58	808	1,410	640	205	2,255
*197	515	120	30	665	125	15	6	146	640	135	36	811
198	835	425	71	1,331	305	350	35	690	1,140	775	106	2,021
199	1,190	650	26	1,866	300	300	21	621	1,490	950	47	2,487
200	875	351	0	1,226	320	115	41	476	1,195	466	41	1,702
Total	19,280	8,091	1,064	28,435	5,850	4,460	1,157	11,467	25,130	12,551	2,221	39,902
Less*	850	145	45	1,040	270	45	40	355	1,120	190	85	1,395
Bal.	18,430	7,946	1,019	27,395	5,580	4,415	1,117	11,112	24,010	12,361	2,136	38,507
Avgs.	970	418	54	1,442	294	232	59	585	1,264	651	112	2,027

TABLE NO. 10.

Apples in Plot 10, Season of 1910.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
*211	295	50	5	350	145	45	20	210	440	95	25	560
212	835	575	145	1,555	355	315	23	693	1,190	890	168	2,248
213	720	545	100	1,365	695	815	80	1,590	1,415	1,360	180	2,955
214	900	280	20	1,200	340	190	48	578	1,240	470	68	1,778
215	1,300	350	20	1,670	290	85	43	418	1,590	435	63	2,088
216	1,300	1,350	80	2,730	685	580	86	1,351	1,985	1,930	166	4,081
217	875	570	30	1,475	415	330	118	863	1,290	900	148	2,338
218	925	475	21	1,421	245	210	63	518	1,170	685	84	1,939
219	915	290	11	1,216	230	165	25	420	1,145	455	36	1,636
220	510	85	0	595	125	55	17	197	635	140	17	792
223	700	200	20	920	155	80	39	274	855	280	59	1,194
224	515	65	20	600	100	55	52	207	615	120	72	807
225	425	145	10	580	145	70	21	236	570	215	31	816
*226	275	40	20	335	115	45	38	198	390	85	58	533
*227	255	50	10	315	90	25	34	149	345	75	44	464
228	655	110	30	795	450	275	70	795	1,105	385	100	1,590
229	360	75	10	445	185	20	40	245	545	95	50	690
*230	130	70	5	205	170	25	39	234	300	95	44	439
231	445	100	0	545	385	95	35	515	830	195	35	1,060
Total	12,335	5,425	557	18,317	5,320	3,480	891	9,701	17,655	8,905	1,448	28,008
Less*	955	210	40	1,205	510	140	131	791	1,475	350	171	1,996
Bal.	11,380	5,215	517	17,112	4,810	3,340	760	8,910	16,180	8,555	1,277	26,012
Avgs.	759	348	34	1,141	321	223	51	594	1,079	570	85	1,734

TABLE NO. 11.

Apples in Plot 9, Season of 1910.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
244	710	110	6	826	235	30	25	290	945	140	31	1,116
246	1,975	500	40	2,515	615	240	101	956	2,590	740	141	3,471
247	1,435	542	20	1,997	510	170	67	747	1,945	712	87	2,744
248	1,100	1,105	27	2,232	655	515	107	1,277	1,755	1,620	134	3,509
249	420	100	2	522	255	295	40	590	675	395	42	1,112
250	523	275	13	811	335	130	30	495	858	405	43	1,306
251	530	354	17	901	480	360	37	877	1,010	714	54	1,778
252	970	423	36	1,429	500	375	55	930	1,470	798	91	2,359
253	785	190	20	995	410	175	120	705	1,195	365	140	1,700
*254	165	10	3	178	80	25	13	118	245	35	16	296
255	575	90	65	730	210	80	44	334	785	170	109	1,064
256	115	5	1	121	390	390	96	876	505	395	97	997
*257	175	25	20	220	115	35	10	160	290	60	30	380
258	935	270	45	1,250	345	145	22	512	1,280	415	67	1,762
259	400	220	20	640	210	230	23	363	610	450	43	1,103
260	625	250	6	881	485	560	57	1,102	1,110	810	63	1,983
261	1,698	300	45	2,043	670	345	60	1,075	2,368	645	105	3,118
262	446	120	5	571	135	95	28	258	581	215	33	829
263	2,120	770	45	2,935	455	365	53	873	2,575	1,135	98	3,808
*264	450	5	5	460	70	40	10	120	520	45	15	580
265	855	25	9	889	165	55	10	230	1,020	80	19	1,119
Total	17,007	5,689	450	23,146	7,325	4,655	1,008	12,978	24,332	10,344	1,458	36,134
Less*	790	40	28	858	265	100	33	398	1,055	140	61	1,256
Bal.	16,217	5,649	422	22,288	7,060	4,555	975	12,580	23,277	10,204	1,397	34,878
Avgs.	901	314	23	1,238	392	253	54	699	1,293	567	78	1,938

TABLE NO. 12.

Apples in Plot 10, Season of 1910.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
*278	95	8	1	104	20	0	2	22	115	8	3	126
*279	375	31	12	418	210	35	16	261	585	66	28	679
280	950	70	15	1,035	210	250	51	511	1,160	320	66	1,546
281	690	65	6	761	215	295	104	614	905	360	110	1,375
282	640	15	2	657	170	215	70	455	810	230	72	1,112
283	925	165	5	1,095	270	460	80	810	1,195	625	85	1,905
284	2,080	915	15	3,010	440	850	155	1,445	2,520	1,765	170	4,455
285	1,940	235	20	2,195	240	470	70	780	2,180	705	90	2,975
286	1,865	235	10	2,110	280	255	30	565	2,145	490	40	2,675
287	1,120	500	61	1,681	335	625	26	986	1,455	1,125	87	2,667
288	605	30	0	635	225	80	12	317	830	110	12	952
*290	1,050	50	0	1,100	530	100	40	670	1,580	150	40	1,770
291	2,000	365	25	2,390	485	205	48	738	2,485	570	73	3,128
292	1,580	70	25	1,675	460	235	55	750	2,040	305	80	2,425
293	775	60	7	842	240	205	97	542	1,015	265	104	1,384
294	790	10	20	820	265	110	94	469	1,055	120	114	1,289
295	548	12	3	563	210	130	15	355	758	142	18	918
Total	18,028	2,836	227	21,091	4,805	4,520	965	10,290	22,833	7,356	1,192	31,381
Less*	470	39	13	522	230	35	18	283	700	74	31	805
Bal.	17,558	2,797	214	20,569	4,575	4,485	947	10,007	22,133	7,282	1,161	30,576
Avgs.	1,171	186	14	1,371	305	299	63	667	1,476	486	77	2,038

TABLE NO. 13.

Apples in Plot 11, Season of 1910.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
180	1,205	568	26	1,799	340	200	30	570	1,545	768	56	2,369
181	1,075	235	41	1,351	265	100	57	422	1,340	335	98	1,773
198	835	425	71	1,331	305	350	35	690	1,140	775	106	2,021
199	1,190	650	26	1,866	300	300	21	621	1,490	950	47	2,487
200	875	351	0	1,226	320	115	41	476	1,195	466	41	1,702
*201	265	20	5	290	130	40	13	183	395	60	18	473
202	1,185	300	20	1,505	575	425	19	1,019	1,760	725	39	2,524
203	910	150	5	1,065	605	720	40	1,365	1,515	870	45	2,430
218	925	475	21	1,421	245	210	63	518	1,170	685	84	1,939
219	915	290	11	1,216	230	165	25	420	1,145	455	36	1,636
220	510	85	0	595	125	55	17	197	635	140	17	792
223	700	200	20	920	155	80	39	274	855	280	59	1,194
240	1,720	170	0	1,990	425	250	30	705	2,145	420	30	2,595
241	2,195	475	25	2,695	620	360	28	1,008	2,815	835	53	3,703
246	1,975	500	40	2,515	615	240	101	956	2,590	740	141	3,471
247	1,435	542	20	1,997	510	170	67	747	1,945	712	87	2,744
263	2,120	770	45	2,935	455	365	53	873	2,575	1,135	98	3,808
*264	450	5	5	460	70	40	10	120	520	45	15	580
*267	102	16	6	124	55	60	8	123	157	76	14	247
268	1,735	25	11	1,771	350	225	45	620	2,085	250	56	2,391
269	1,025	65	5	1,095	305	330	50	685	1,330	395	55	1,780
285	1,940	235	20	2,195	240	470	70	780	2,180	705	90	2,975
286	1,865	235	10	2,110	280	255	30	565	2,145	490	40	2,675
287	1,120	500	61	1,681	335	625	26	986	1,455	1,125	87	2,667
290	1,050	50	0	1,100	530	100	40	670	1,580	150	40	1,770
291	2,000	365	25	2,390	485	205	48	738	2,485	570	73	3,128
Total	31,322	7,702	519	39,543	8,870	6,455	1,006	16,331	40,192	14,157	1,525	55,874
Less*	1,817	41	16	1,874	255	140	31	426	1,072	181	47	1,300
Bal.	30,505	7,661	503	38,669	8,615	6,315	975	15,905	39,120	13,976	1,478	54,574
Avgs.	1,326	333	22	1,681	375	275	42	692	1,701	608	64	2,373

TABLE NO. 14.

Two Rows, One Row Distant from Limed Plot. Check for Limed Plot.

Tree No.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
183	890	435	36	1,361	185	325	390	900	1,075	760	426	2,261
184	1,175	375	55	1,605	155	155	80	390	1,330	530	135	1,995
195	1,075	637	128	1,840	455	300	60	805	1,520	937	188	2,645
196	925	375	147	1,447	485	265	58	808	1,410	640	205	2,255
205	825	95	10	930	375	215	30	620	1,200	310	40	1,550
206	1,265	150	0	1,415	560	365	28	953	1,825	515	28	2,368
215	1,300	350	20	1,670	290	85	43	418	1,590	435	63	2,088
216	1,300	1,350	80	2,730	685	580	86	1,351	1,985	1,930	166	4,081
225	425	145	10	580	145	70	21	236	570	215	31	816
237	655	245	5	905	660	200	50	910	1,315	445	55	1,815
238	925	65	1	991	475	130	53	658	1,400	195	54	1,649
249	420	100	2	522	255	295	40	590	675	395	42	1,112
250	523	275	13	811	335	130	30	495	858	405	43	1,306
260	625	250	6	881	485	560	57	1,102	1,110	810	63	1,983
261	1,698	300	45	2,043	670	345	60	1,075	2,368	645	105	3,118
271	1,545	312	30	1,887	655	590	16	1,261	2,200	902	46	3,148
272	1,365	275	9	1,649	455	545	62	1,052	1,810	820	71	2,701
282	640	15	2	657	170	215	70	455	810	230	72	1,112
283	925	165	5	1,095	270	460	80	810	1,195	625	85	1,905
292	1,580	70	25	1,675	460	235	55	750	2,040	305	80	2,425
293	775	60	7	842	240	205	97	542	1,015	265	104	1,384
297	1,125	55	0	1,180	965	305	72	1,342	2,090	360	72	2,522
298	1,500	120	16	1,636	615	265	56	936	2,115	285	72	2,572
Total	23,481	6,219	652	30,352	10,025	6,840	1,594	18,459	33,506	13,059	2,246	48,811
Avgs.	1,021	270	28	1,320	436	297	69	802	1,457	568	98	2,122

Deductions from Results Obtained in 1910.

The author is fully aware of the danger of drawing conclusions from the results of one season's work, and therefore he presents the matter in the form of deductions rather than as conclusions. At the same time, the reader's attention is called to the fact that two preliminary seasons of very careful and accurate work have preceded the season of 1910. Moreover, the crop in the orchard was large and the differences between the crops in the various plots were marked.

In table No. 15, which follows, will be found summarized the average number of apples per tree per plot, for 1910. This table is placed in this position for convenience in comparing the deductions which follow with the records on which they are based.

TABLE NO. 15.

Table Showing Average Number of Apples and Percentage of Bloom per Tree in all Plots in Woodman Orchard, 1910.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	No. 1	No. 2	Culls.	Total.	% Bloom.
1	In sod. No cultivation.	None.	None.	159	159	162	481	14.50
2	Plowed early in May, 1909. Cult. every 2 weeks till July 10. In grass 1908 & 10.	None.	Crimson clover sown July 10, '09.	610	533	106	1,249	35.25
3	Plowed early in May, 1908 & 10. Cult. every 2 weeks till July 10. In grass 1909.	None.	Crimson clover sown July 10, 1908 & 10.	1,305	821	185	2,311	54.80
4	Plowed early in May. Cult. every 2 weeks till Sept. 1, annually.	None.	None.	954	779	126	1,859	43.57
5	Plowed early in May. Cult. every 2 weeks till July 10, annually.	None.	Crimson clover sown July 10, annually.	1,090	1,123	168	2,381	56.20
6	Plowed early very deeply in May. Cult. every 2 weeks till July 10, annually.	Normal amts. N. P. K.	Crimson clover sown July 10, annually.	1,075	654	114	1,842	44.70
7	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amts. N. P. K.	Crimson clover sown July 10, annually.	1,264	651	112	2,027	53.40

Table Showing Average Number of Apples and Percentage of Bloom per Tree in all Plots in Woodman Orchard, 1910.

8	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amts. N. and K. Excess Phosphoric acid.	Crimson clover sown July 10, annually.	1,079	570	85	1,734	39.10
9	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amts. K. and P. Excess Nitrogen.	Crimson clover sown July 10, annually.	1,293	567	78	1,938	44.55
10	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Normal amts. N. and P. Excess Potassium.	Crimson clover sown July 10, annually.	1,476	486	77	2,038	62.74
11	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Limed. Crosses and includes sections of 7, 8, 9, 10.	Crimson clover sown July 10, annually.	1,701	608	64	2,373	57.10
*12	Plowed early in May. Cult. every 2 weeks till July 10, annually.	Unlimed. Crosses and includes sections of 7, 8, 9, 10.	Crimson clover sown July 10, annually.	1,457	568	98	2,122	53.96

N = Nitrogen. P = Phosphorus. K = Potassium.

* Check for 11 only.

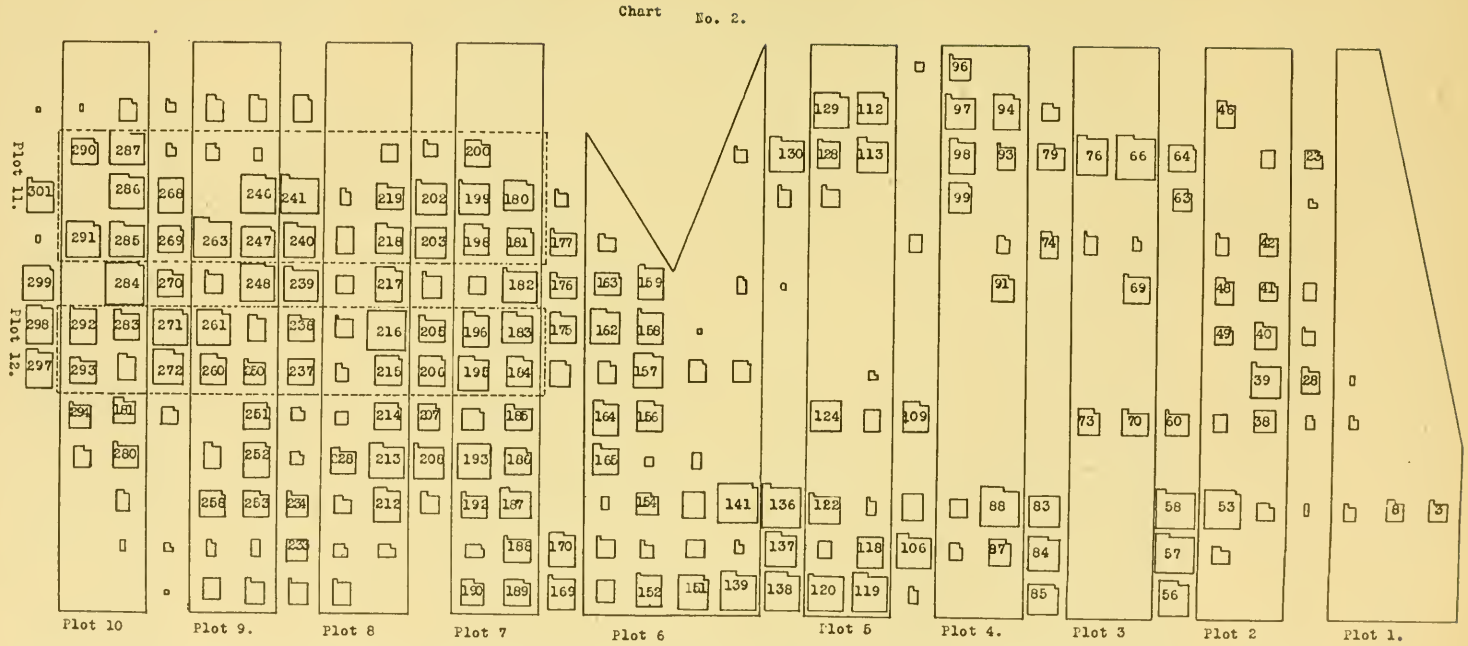
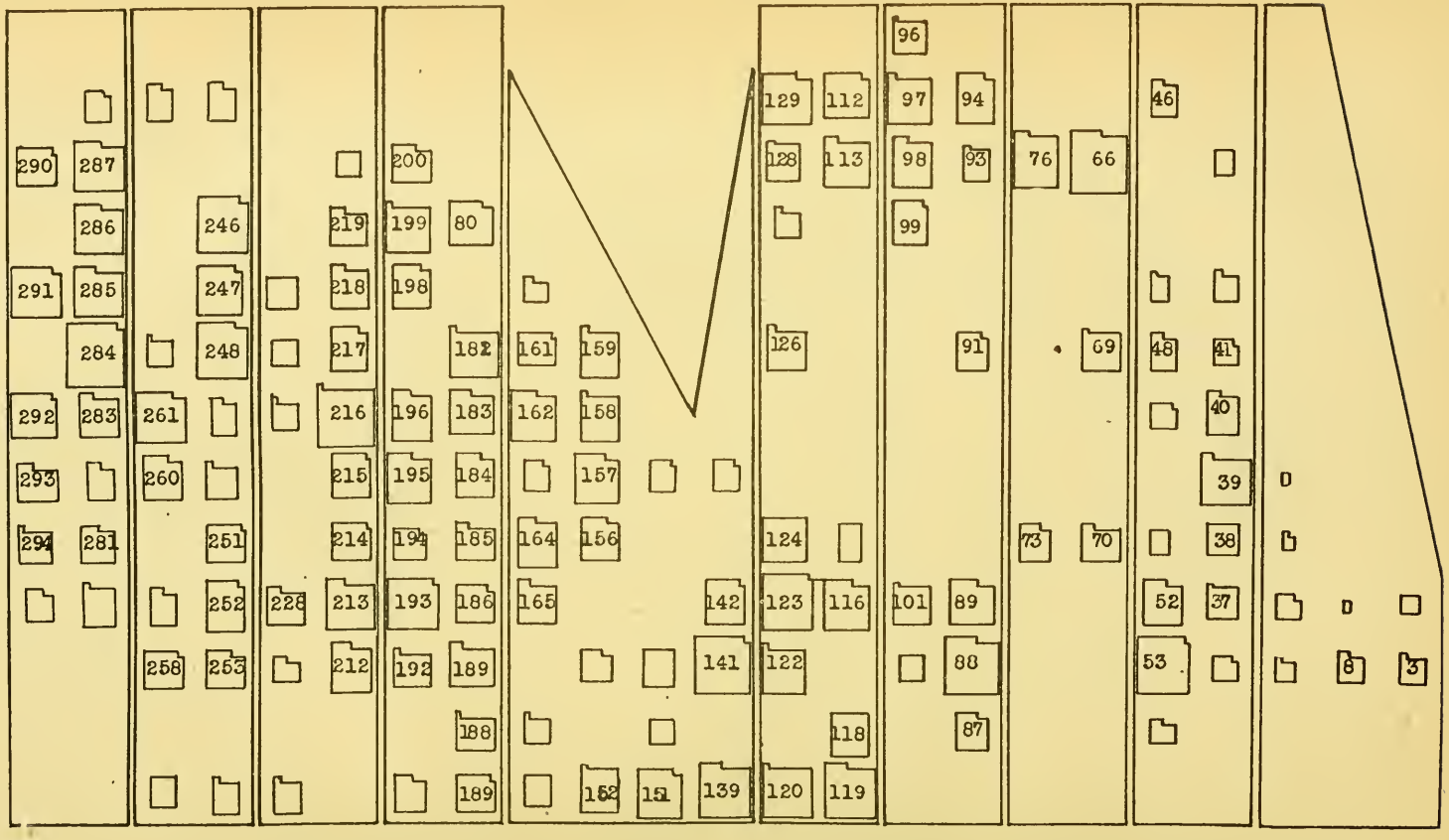


Chart No. 2. Showing Diagramatically the Production of Apples and Their Distribution, Tree by Tree, in 1910.

NOTE.—The numbers were omitted where the diagrams were too small to permit their insertion.



Plot 10. plot 9. Plot 8. Plot 7 Plot 6. Plot 5 Plot 4 Plot 3. Plot 2 Plot 1.

Chart No. 3. Showing Diagramatically the Production of Apples and Their Distribution, Tree by Tree, in 1910, with Division Rows, Exceptional Individuals, and Discarded Trees Omitted.

NOTE.—The numbers were omitted where the diagrams were too small to permit their insertion.

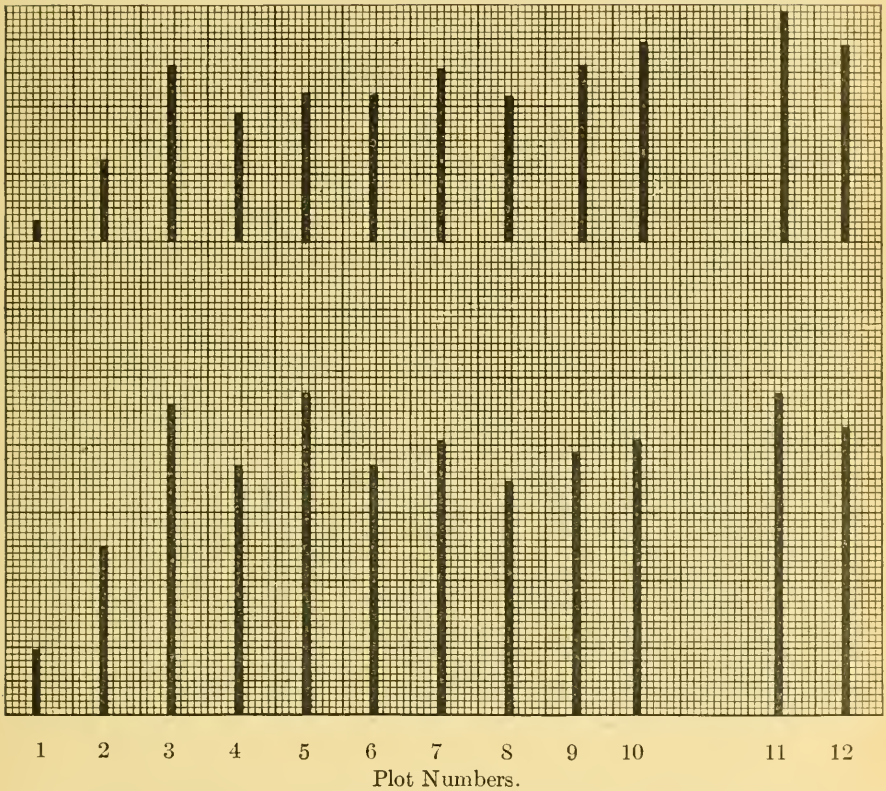


Chart No. 4. The Upper Row of Columns Indicates the Comparative Number of No. 1 Apples per Tree in Each Plot. The Lower Row Indicates the Comparative Number of All Apples per Tree in Each Plot.

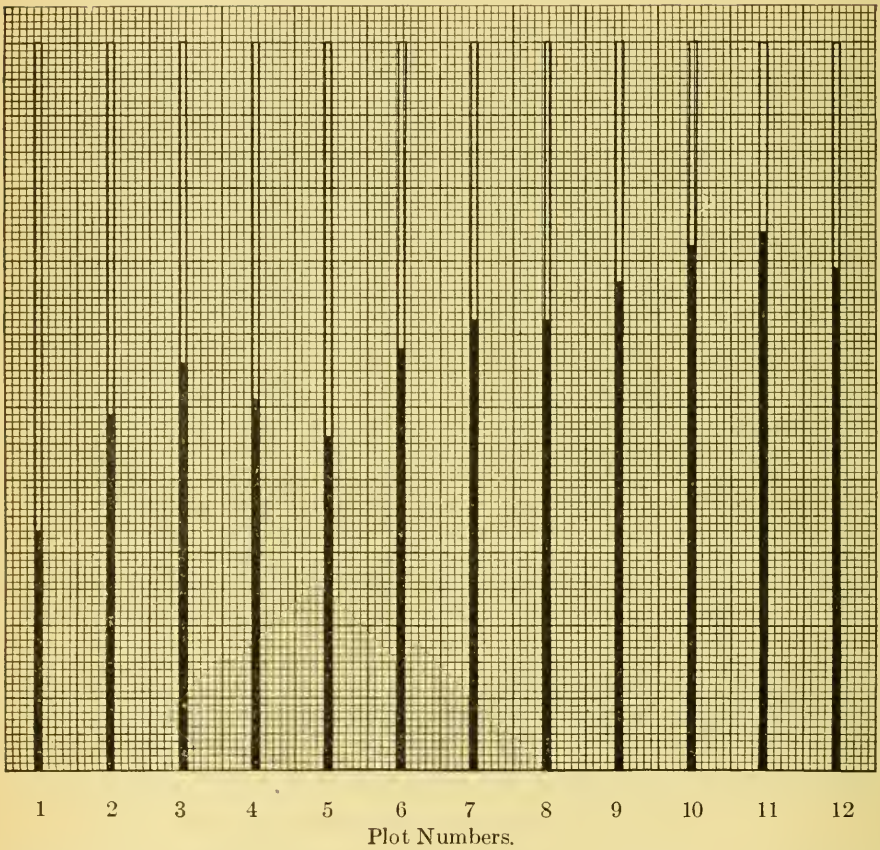


Chart No. 5. Shows the Relative Percentages of No. 1 as Compared with No. 2 and Cull Apples, Plot by Plot. No. 1 Apples are Shown by the Heavy Block Lines; No. 2 and Cull Apples, are Shown by the Lighter Space Extending from the Block Lines to the Line near the Top of the Chart.

DEDUCTIONS.

A. As to Formation of Fruit Buds.

1. Thorough cultivation throughout the season from May 15th to September 1st, without the addition of cover crop or fertilizer, resulted in the production of three times as many blossoms (fruit buds) and somewhat more than three times as much fruit as no cultivation (sod). (Compare plots 4 and 1, tables No. 15 and No. 16.)

TABLE NO. 16.

Average Number of Apples per Tree in Plots 1 and 4.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	No. 1	No. 2	Culls.	Total.
1	None—In sod	None	None	159	159	162	481
4	Plowed early in May. Cultivated every two weeks till Sept. 1.	None	None	954	779	126	1,859

2. Clean cultivation throughout the season produced considerably fewer fruit buds and a noticeably smaller crop of fruit than cultivation till July 10th with a cover crop of crimson clover sown with the last cultivation and plowed under the following spring. (Compare plots 4 and 5, tables Nos. 15 and 17.)

TABLE NO. 17.

Average Number of Apples per Tree in Plots 4 and 5.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	No. 1	No. 2	Culls.	Total.
4	Plowed early in May. Cultivated every 2 weeks till Sept. 1.	None	None	954	779	126	1,859
5	Plowed early in May. Cultivated every 2 weeks till July 10.	None	Crimson clover sown July 10.	1,090	1,123	168	2,381

3. The results indicate that clean cultivation till July 10th followed by a cover crop of crimson clover, alternating every other year with a stand of mixed clover and grass sown early in the spring, *may* produce a sufficient number of fruit buds for a satisfactory crop. (Compare plots 1, 2, 3, 4 and 5 in table No. 15.) This cannot be conclusively shown till the experiments have progressed at least one more season.

4. Cultivation and cover crop one year in three produced only two-thirds as many fruit buds and one-half as many apples as cultivation two years in three. (Compare plots 2 and 3 in table No. 15.)

5. Cultivation and cover crop one year in three doubled the production of fruit-buds and increased the crop of apples three times compared with no cultivation at all. (Compare plots 1 and 2, tables Nos. 15 and 18.)

6. Cultivation and cover crop two years in three gave almost as good results as cultivation and cover crop yearly. (Compare plots 3 and 5 in tables Nos. 15 and 18.)

TABLE NO. 18.

Average Number of Apples per Tree in Plots 1, 2, 3, 4, and 5.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	No. 1	No. 2	Culls.	Total.
1	None—In sod.	None	None	159	159	162	481
2	Plowed early in May '09. Cultivated every 2 weeks till July 10. In grass 1908 & 10.	None	Crimson Clover sown July 10, 1909.	610	533	106	1,249
3	Plowed early in May, 1908 & 10. Cultivated every 2 weeks till July 10. In grass 1909.	None	Crimson Clover sown July 10, 1908&10.	1,305	821	185	2,311
4	Plowed early in May. Cultivated every 2 weeks till Sept. 1, yearly.	None	None	954	779	126	1,859
5	Plowed early in May. Cultivated every 2 weeks till July 10, yearly.	None	Crimson Clover sown July 10.	1,090	1,123	168	2,381

7. The use of fertilizers in addition to cultivation and cover crops failed to result in an increased production of fruit buds. (Compare all fertilized plots, 6 to 10 inclusive, with plot 5, which received the same cultural treatment, table No. 15.)

8. The use of a fertilizer relatively rich in phosphoric acid (in the form of acid phosphate) resulted in the least production of fruit buds among the fertilized plots. (Compare plot 8 with plots 7, 9. and 10. Table No. 19.)

9. The number of fruit buds was not increased by excess applications of nitrogen and phosphoric acid over normal applications. (Compare plots 8, 9, and 10 with plot 7, table No. 19.)

10. The number of fruit buds appeared to be slightly increased by the application of an excess of potash. (Compare plots 7 and 10, table No. 15) but the difference was hardly noticeable in the crop (compare plots 7 and 10, table No. 19).

TABLE NO. 19.

Average Number of Apples per Tree in Plots 5, 7, 8, 9, 10.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	Apples.
5	Plowed early in May. Cultivated till July 10, yearly.	None.	Crimson clover sown July 10.	2,381
7	Plowed early in May. Cultivated till July 10, yearly.	Normal amts. Nitrogen and Potassium.	Crimson clover sown July 10.	2,027
8	Plowed early in May. Cultivated till July 10, yearly.	Normal amts. Nitrogen and Potassium, Excess Phosphorus.	Crimson clover sown July 10.	1,734
9	Plowed early in May. Cultivated till July 10, yearly.	Normal amts. Potassium and Phosphorus, Excess Nitrogen.	Crimson clover sown July 10.	1,938
10	Plowed early in May. Cultivated till July 10, yearly.	Normal amts. Phosphorus and Nitrogen, Excess Potassium.	Crimson clover sown July 10.	2,038

11. The number of fruit buds was noticeably greater in a plot to which was applied agricultural lime than in a corresponding check plot. (See table No. 20.)

TABLE NO. 20.

Average Number of Apples per Tree in Plot 11 and Check Plot 12.

Plot No.	Cultivation.	Fertilizer.	Cover Crop.	Apples.
11	Plowed early in May. Cultivated till July 10, yearly.	1,000 lbs. lime per acre. Crosses plots 7, 8, 9 and 10.	Crimson clover sown July 10.	2,373
12	Plowed early in May. Cultivated till July 10, yearly.	Unlimed. Crosses plots 7, 8, 9, and 10.	Crimson clover sown July 10.	2,122

12. The inability of apple trees to produce fruit buds when grown in sod as compared with cultivation has been clearly and completely proven. Where the trees received only one year's cultivation in three, they produced three times as many apples as were produced under sod. (Compare plots 1 and 2, table 18, and all other plots with plot 1, table 15.)

13. A general review of all results for 1910 indicates that a plentiful supply of moisture (as a result of conservation by cultivation) was the most influential factor in stimulating the production of fruit buds.

14. The addition of nitrogen in the form of a cover-crop appeared to be the second most important factor in stimulating the production of fruit buds.

Bs As to Secondary Effects of the Treatments.

1. While fertilizers failed to stimulate a greater production of fruit buds they clearly improved the size and quality of the fruit. (See No. 1 apples, table No. 15 and charts Nos. 4 and 5.)

2. The largest quantity of No. 1 fruit per tree was produced in the limed plot. This plot was, of course, fertilized, each section receiving the fertilizer treatment of the plot which crossed it. (See charts Nos. 4 and 5.)

3. The next largest quantity of No. 1 fruit per tree was produced in the plot which received the excess of potash. (See table No. 15 and charts Nos. 4 and 5.)

4. The fewest No. 1 apples were produced by the sod plot. (See table No. 15 and charts Nos. 4 and 5.)

5. The most highly colored apples were produced by the sod plot.

6. Among the fertilized plots the excess phosphoric acid plot produced the smallest apples, though the fruit ran uniformly of good quality.

C. As to Effect of Spraying.

1. All plots were sprayed alike. The relatively small number of buds produced by the sod plot would indicate that spraying had at least only an indirect influence on fruit bud formation.

TABLE NO. 21.

Average Number of Apples per Tree in Each Plot in 1908, 1909, 1910.

PLOT 1.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	130	160	33	323	9	62	73	144	139	222	106	467
1909	13	20	5	38	23	23	11	57	35	44	16	95
1910	88	78	52	218	72	81	110	263	159	159	162	481

TAPLE NO. 21.—*Continued.*

Average Number of Apples per Tree in Each Plot in 1908, 1909, 1910.

PLOT 2.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	78	49	7	133	7	11	15	33	85	59	22	166
1909	45	8	1	54	7	3	3	14	53	11	5	68
1910	369	273	47	690	241	260	58	559	610	533	106	1,249

PLOT 3.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	60	27	5	92	5	8	13	26	65	35	18	118
1909	23	1	2	26	49	14	12	75	67	20	14	101
1910	906	514	76	1,495	400	307	110	817	1,305	821	185	2,311

PLOT 4.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	45	31	4	80	5	7	13	25	50	38	17	105
1909	38	3	3	44	41	8	13	62	80	11	16	106
1910	765	507	49	1,321	188	273	77	538	954	779	126	1,859

PLOT 5.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	23	24	9	56	3	8	10	21	27	32	19	78
1909	27	4	1	31	36	7	5	49	64	11	15	79
1910	763	786	127	1,675	328	336	41	706	1,090	1,123	168	2,381

TABLE NO. 21.—*Continued.*

Average Number of Apples per Tree in Each Plot in 1908, 1909, 1910.

PLOT 6.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	24	20	3	47	2	9	9	20	26	30	13	69
1909	22	2	0	24	22	4	6	32	44	6	6	56
1910	822	395	56	1,272	253	258	58	569	1,075	654	114	1,842

PLOT 7.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	27	18	1	46	2	7	12	21	29	25	14	68
1909	21	4	1	26	33	8	4	45	53	12	5	70
1910	970	418	54	1,442	294	232	59	585	1,264	651	112	2,027

PLOT 8.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	22	13	1	36	3	7	13	23	14	21	25	60
1909	27	3	1	31	33	8	6	47	61	11	6	78
1910	759	348	34	1,141	321	223	51	594	1,079	570	85	1,734

PLOT 9.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls.	Total.	No. 1	No. 2	Culls.	Total.	No. 1	No. 2	Culls.	
1908	63	12	0	75	8	9	14	31	71	21	14	109
1909	22	2	1	24	49	8	8	65	72	9	8	89
1910	901	314	23	1,238	392	54	54	699	1,293	567	78	1,938

TABLE NO. 21.—*Concluded.*

Average Number of Apples per Tree in Each Plot in 1908, 1909, 1910.

PLOT 10.

Year.	Picked Apples.				Dropped Apples.				Totals.			Grand Total.
	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	Total	No. 1	No. 2	Culls	
1908	82	15	4	101	7	9	7	23	88	24	13	125
1909	16	0	0	16	10	1	1	12	26	1	1	28
1910	1,171	186	14	1,371	305	299	63	667	1,476	486	77	2,038

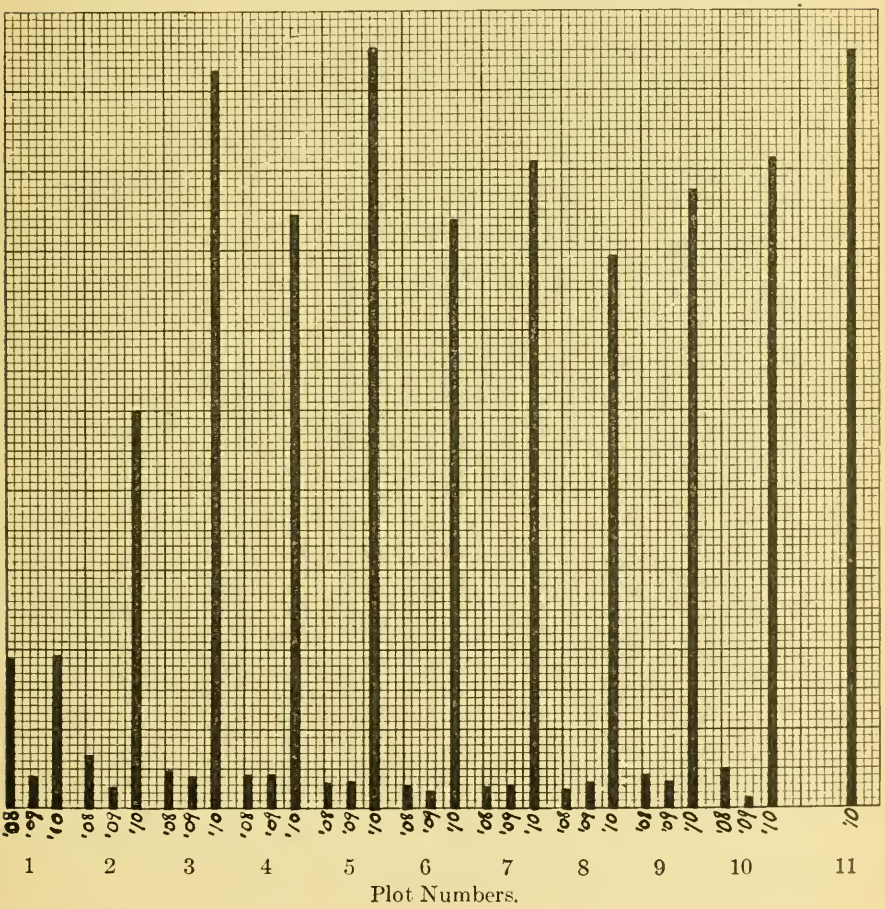


Chart No. 6. Shows the Relative Production of each Plot for 1908, 1909, 1910.

SUMMARY OF THREE SEASONS' WORK.

Table No. 21 and the accompanying chart, No. 6, give a summary of the average production of each tree in the various plots for the seasons of 1908, 1909, and 1910. No attempt is made to total these results as the author does not believe that those of 1908 are of any value except for purposes of comparison with the results of later seasons, while those of 1909 are so small as to possess no real significance in this study of fruit bud formation, *when used for purposes of comparison between individual plots.* These figures are, however, of extreme importance in comparing one season with another. The Baldwin is notoriously accredited with the habit of bearing in alternate years. If, therefore, the treatments of cultivation and fertilization accorded one or several of the plots under experimentation, affect one way or another this habit of alternate bearing, light of considerable value will be thrown upon the subject of this investigation.

Moreover, in a very decided manner, this summary of the three years' work indicates a most startling effect in increased productiveness under cultivation, cultivation and cover crop, and cultivation, cover crop and fertilization. A glance at chart No. 6 will show that in 1908 the sod plot produced more apples per tree than any other plot in the orchard. This plot must therefore have had advantages at least equal to and probably superior to those of other plots in the orchard, but immediately after cultivation, fertilization, and cover cropping were practiced in other plots in the orchard, the production of the sod plot fell far behind.

Climatic Conditions.

No unusual peculiarities of temperature or rainfall have marked any of the easons of the experiment. Winter temperatures, covering of snow, blossoming period and times of rainfall have, without exception, been reasonably favorable for the development of good crops of fruit.

Acknowledgements.

The writer takes pleasure in acknowledging gratefully the cheerful and efficient assistance of Prof. W. H. Wicks, Mr. T. G. Bunting and Prof. W. H. Wolff in collecting the data and carrying out many of the details of the experiments. Professor Wicks, now professor of Horticulture in the University of Idaho, assisted in 1908–09; Mr. Bunting in 1909, and Professor Wolff in 1910.

Sorting, Grading, and Recording Apples in 1910.

Typical Tree in Sod Plot, October 25, 1909.

Typical Tree in Cultivated Plots, October 25, 1909.
Note late retention of foliage.

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